

TIER 1

**UNDERGROUND INJECTION CONTROL
PERMIT APPLICATION**

Ute Tribal # 31-03
422' FNL & 2338' FWL
Sec. 31, T5S-R3W
Duchesne County, Utah
API # 43-013-31188

July 2015

Prepared for:
Bruce Suchomel
Groundwater Program, Mail Code 8P-W-UIC
U.S. Environmental Protection Agency
1595 Wynkoop St
Denver, CO 80202-1129

Prepared by:
Petroglyph Energy, INC.
960 Broadway Avenue, Suite 500, P.O. Box 70019
Boise, Idaho 83707
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FAX (208) 685-7605

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PERMIT APPLICATION

• MISSING AOR DATA
• DEVIATION LOGS
• SUNDRY REPORTS
• CBLs FOR AOR wells.
OLD CBL LOG.
• HOW WAS USED DERN.
31-03

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- | | |
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SUMMARY DOCUMENT
UIC WELL APPLICATION
Ute Tribal 31-03
API # 43-013-31188

The following document contains information provided in support of the application for the conversion of the Ute Tribal 31-03 well to an injection well in the Green River formation in the Antelope Creek Field in Duchesne County, Utah.

The Antelope Creek Field falls within the Uintah and Ouray Indian reservations and is within Indian Country; therefore, for facilities located on the reservation, only EPA-issued UIC permits are necessary for compliance with UIC regulations.

The EPA has issued an Area Permit #UT20736-00000 for the Underground Injection Control for the Antelope Creek Field. This area permit allows for additional producing wells to be converted to injection wells for enhanced recovery.

- (1) Petroglyph Energy, Inc. (Petroglyph) is the operator and only working interest owner of wells located in the Antelope creek Field, Duchesne County, Utah. Petroglyph's business address is provided below:

Petroglyph Energy, Inc.
960 Broadway Avenue, Suite 500
P.O. Box 70019
Boise, ID 83707

- (2) Enclosed as Attachment No. 1 is a topographic map of a portion of the Antelope Creek Field, identifying all wells located in this area. The legal location for the Ute Tribal 31-03 is 422' FNL & 2338' FWL NE/NW Sec. 31, T5S-R3W.
- (3) Attachment No. 2 is a map of the well. This map shows a circle with a ¼ mile radius centered on the Ute Tribal 31-03 well. The ¼ mile radius encompasses the area of review, AOR, within which Petroglyph is required to investigate all wells for mechanical integrity. The ¼ mile radius also identifies mineral ownership; all lands within the AOR are leased to Petroglyph by the Ute Tribe as indicated by yellow shading. The AOR has Ute Tribal 30-14, Ute Tribal 30-14N, and Ute Tribal 31-02 well(s) located in its ¼ mile radius.

- (4) Petroglyph proposes to utilize the Ute Tribal 31-03 as an injection well for enhanced recovery in the Antelope Creek Field.
- (5) Injection Zone – The injection intervals are between 3968' and 5944' True Vertical Depth and located in the lower portion of the Green River Formation. The injection zone is confined within a 1976' section between the Green River "A" Lime marker bed and the top of the Basal Carbonate in the lower part of the formation. The injection zone is composed of lenticular calcareous sandstones interbedded with low permeable carbonates and calcareous shales. The lenticular sandstones vary in thickness from 1 to 30 feet.

Confining Zone – The overall confining strata above the injection zone consists of impermeable Green River calcareous shales and continuous beds of microcrystalline dolostone. The confining zone in the Ute Tribal 31-03 is 222 feet thick.

Attachment No. 3 is a structure map of the A-Marker surface.

Attachment No. 4 is a cross-section of the injection interval and confining zone.

- (6) Enclosed as Attachment No. 5 are standard analyses of produced water from three batteries that currently serve as central handling facilities for all project producing wells. The analysis of the Green River formation water from the Ute Tribal 18-08 Satellite Battery is 12805 mg/L of total dissolved solids (TDS), Ute Tribal 21-11 Satellite Battery is 15659 mg/L TDS, and Ute Tribal 34-12-D3 Satellite Battery is 14590 mg/L TDS.

Injectate in the field is a mixture of produced water and fresh make-up water. The nearest injection well is the Ute Tribal 30-15, the most recent analysis of the water being injected into the Green River formation at this location is 10160 mg/L TDS. This analysis is also included in Attachment No. 5.

- (7) A summary of completion data from the Ute Tribal 31-03 and offset wells in the AOR are included in Attachment No. 6
- (8) The cement bond log is included in Attachment No. 7.
- (9) The open hole log for the Ute Tribal 31-03 is included in Attachment No. 8.

(10) The Antelope Creek Field is operated under a Cooperative Plan of Development between the Ute Tribe and Petroglyph Energy. At the Ute Tribal 31-03 location, all mineral owners, surface owners and operators located within the AOR ¼ mile radius have been notified of the submitted EPA application to convert to injection. Attachment No. 9 is the Affidavit of Notification to all owners.

(11) Petroglyph requests a maximum surface injection pressure of **1801psi**. The EPA Area Permit No. UT20736-00000 uses the formula:

$$P_m = (0.88\text{psi/ft} - 0.43\text{psi/ft}(S_g)) D$$

Where:

P_m = Maximum surface injection pressure

0.88psi/ft = Fracture gradient

D = Top perforation depth

0.43psi/ft = Hydrostatic pressure/hydraulic head

S_g = Specific gravity of injection fluid

For the Ute Tribal 31-03:

$$\mathbf{1801psi = (0.88psi/ft - 0.43(1.00)) 4002ft}$$

(12) Three wellbore diagrams for the Ute Tribal 31-03 are in Attachment No. 10. One diagram is for production, one for injection, and one for Plug & Abandonment (P&A).

(13) The P&A procedure for this well is shown in Attachment No. 11.

(14) Once the draft permit is issued, Petroglyph will conduct a Mechanical Integrity Test and a static bottom-hole pressure test. The MIT procedure is contained in Attachment No. 12. The conversion work will be satisfactorily completed and submitted to the EPA on Form 7520-12. A wellbore schematic will be included with this form.

- (15) Petroglyph will give proof of financial responsibility by posting a surety bond for the UIC well prior to final permit approval. A copy of this letter is contained in Attachment No. 13.
- (16) Petroglyph will install various gauges on the well so that the injection pressure and tubing/casing annulus pressure can be monitored. The well will be equipped with a flow meter with a cumulative volume recorder.

Well Completion Data
Ute Tribal 31-03

Well	Surface Casing				Production Casing			
	Size (inches)	Depth (ft KB)	Cement Amount (sx)	Cement Top	Size (inches)	Depth (ft KB)	Cement Amount (sx)	Estimated Cement Top
Ute Tribal 31-03	8-5/8	403	250	surface	5-1/2	6000	1300	2520'
Ute Tribal 30-14	8-5/8	272	165	surface	5-1/2	6005	640	surface
Ute Tribal 30-14N	8-5/8	430	270	surface	5-1/2	6347	915	surface
Ute Tribal 31-02	8-5/8	397	350	surface	5-1/2	6651	1450	surface

Ute Tribal 31-03 Well History

Well History:

Spud Well: 6/11/19687

Completed: 8/13/1987

First Production: 8/15/1987

Tops (KB):

BMSW* Found at 1753'

Green River 1497'

A Marker 3968'

X Marker 4451'

Douglas Creek 4590'

B Limestone 4962'

Castle Peak 5455'

Basal Carbonate 5944'

Perf History

8/5/1987

B02	4002' to 4012'
C05.5	4741' to 4747'
C09.2	4909' to 4915'
D3	5031' to 5037'
D7	5207' to 5216'
E07	5845' to 5853'

4/19/2012

B07+	4262' to 4270'
B10	4361' to 4367'
B12	4476' to 4478'
C05	4643' to 4646'
D3	5043' to 5049'
D7	5219' to 5226'
E01.1	5516' to 5523'
E01.2	5586' to 5590'
E03.3	5646' to 5648'

Petroglyph Operating Co., Inc.

Ute Tribal #31-03

(422' FNL & 2338' FWL)

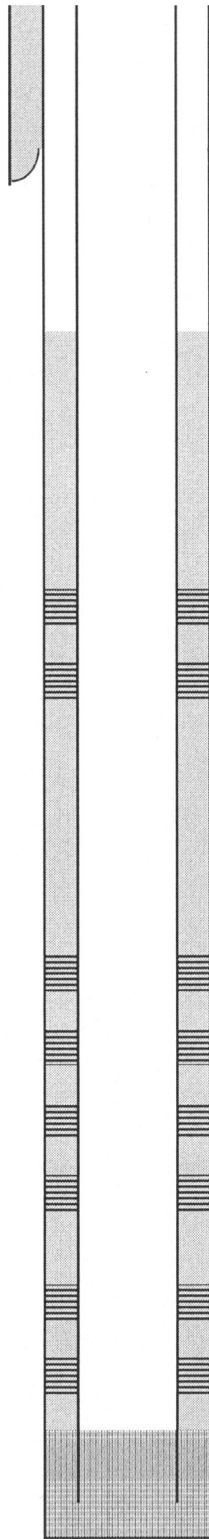
NE NW Section 31, 5S- 3W

Antelope Creek Field

Duchesne Co. Utah

API#: 43013311880000

*Plate 1 Utah Geological Survey Special Study 144.
(2012). BMSW Elevation Contour Map, Uinta Basin,
Utah. [map]. (CA 1:200,000)



GL: 6743'

KB: 6753'

8 5/8" 24# Surface CSG @ 403' KB

cmt'd w/250 sx

Surface Hole size 12 1/4"

Cement top @ 2520'

5 1/2" 15.5# J-55 CSG @ 5955'

cmt'd w/1300 sx

Hole Size 7 7/8" bit

Perf's:

B02 4002' to 4012'

B07+ 4262' to 4270'

B10 4361' to 4367'

B12 4476' to 4478'

C05 4643' to 4646'

C05.5 4741' to 4747'

C09.2 4909' to 4915'

D3 5031' to 5037'

D3 5043' to 5049'

D7 5207' to 5216'

D7 5219' to 5226'

E01.1 5516' to 5523'

E01.2 5586' to 5590'

E03.3 5646' to 5648'

E07 5845' to 5853'

PBTD @ 5942' KB

TD @ 6657' KB

(Not to Scale)

Ute Tribal 31-03 Injection

Well History:

Spud Well: 6/11/19687
Completed: 8/13/1987
First Production: 8/15/1987

Tops (KB):

BMSW* Found at 1753'

Green River 1497'

A Marker 3968'

X Marker 4451'

Douglas Creek 4590'

B Limestone 4962'

Castle Peak 5455'

Basal Carbonate 5944'

Injection packer @ 3912'

GL: 6743'

KB: 6753'

8 5/8" 24# Surface CSG @ 403' KB

cmt'd w/250 sx

Surface Hole size 12 1/4"

Cement top @ 2520'

5 1/2" 15.5# J-55 CSG @ 5955'

cmt'd w/1300 sx

Tubing 2 7/8" 6.5# J55

Hole Size 7 7/8" bit

Perf's:

B02 4002' to 4012'

B07+ 4262' to 4270'

B10 4361' to 4367'

B12 4476' to 4478'

C05 4643' to 4646'

C05.5 4741' to 4747'

C09.2 4909' to 4915'

D3 5031' to 5037'

D3 5043' to 5049'

D7 5207' to 5216'

D7 5219' to 5226'

E01.1 5516' to 5523'

E01.2 5586' to 5590'

E03.3 5646' to 5648'

E07 5845' to 5853'

Petroglyph Operating Co., Inc.

Ute Tribal #31-03

(422' FNL & 2338' FWL)

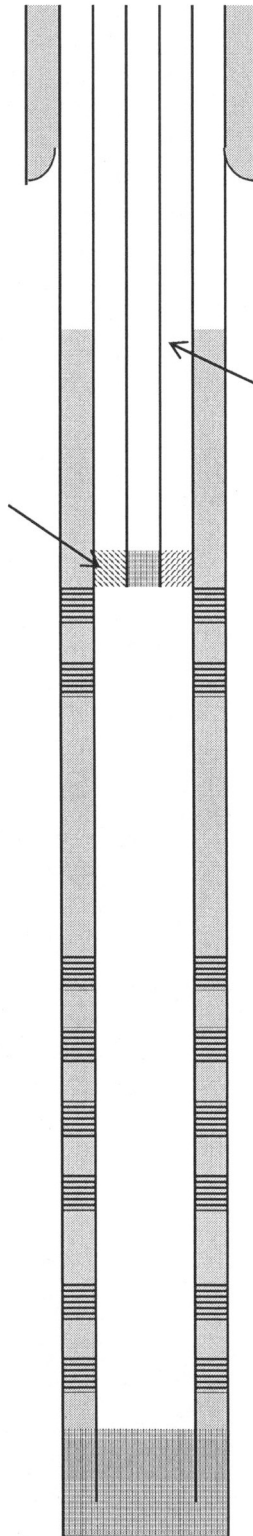
NE NW Section 31, 5S- 3W

Antelope Creek Field

Duchesne Co. Utah

API#: 43013311880000

*Plate 1 Utah Geological Survey Special Study 144.
(2012). BMSW Elevation Contour Map, Uinta Basin,
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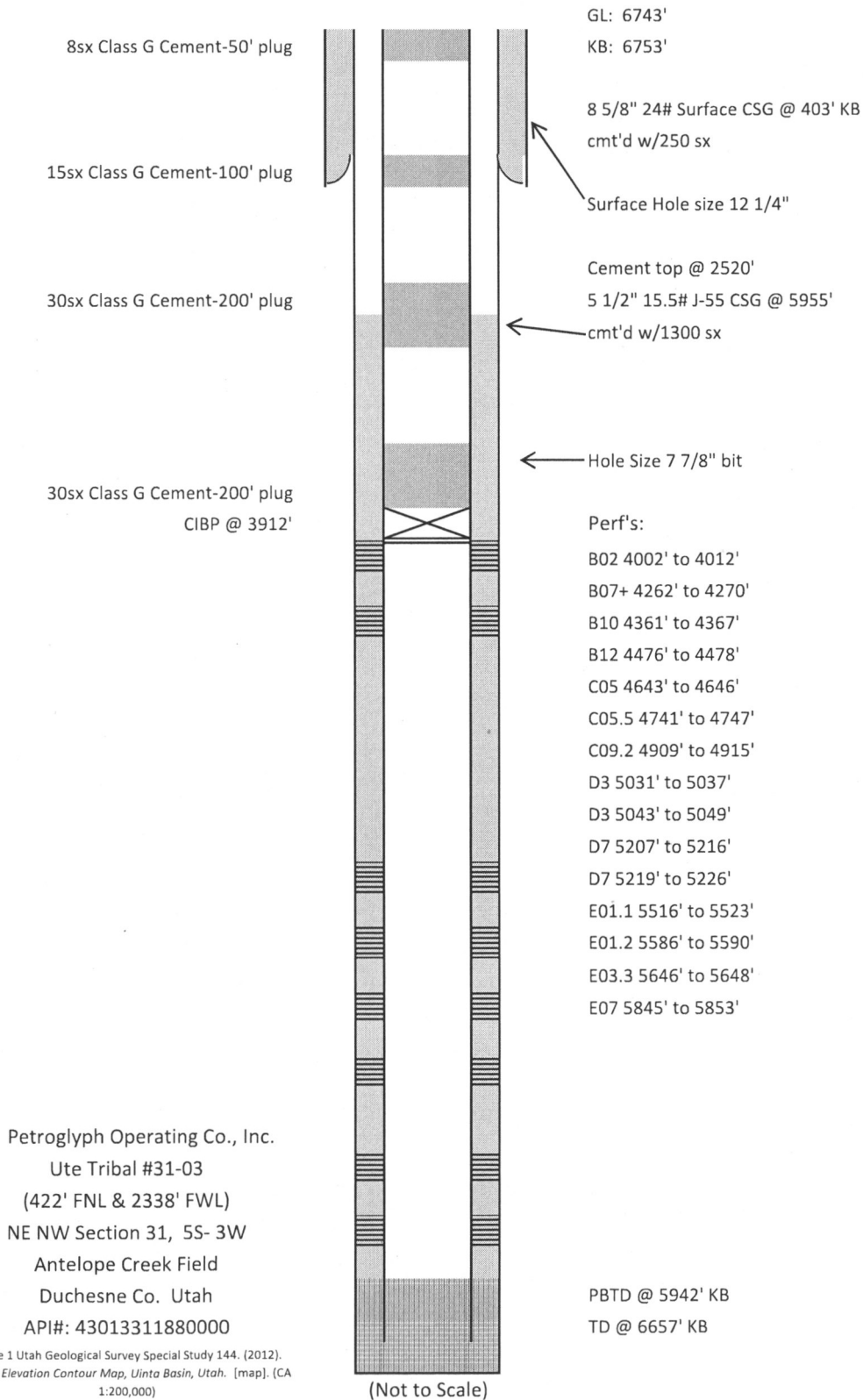


PBTD @ 5942' KB

TD @ 6657' KB

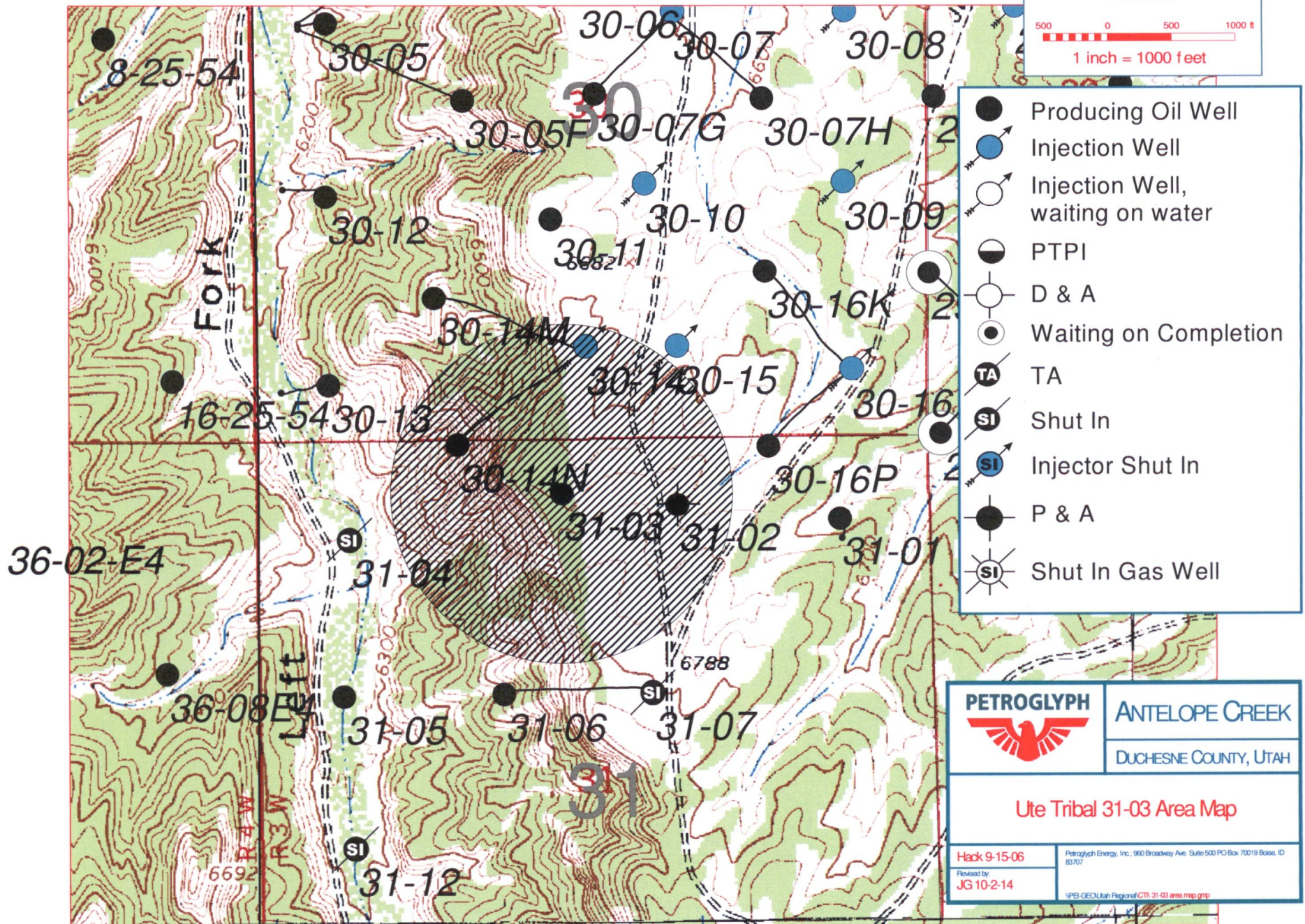
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Ute Tribal 31-03 Plug and Abandonment

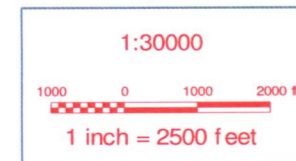
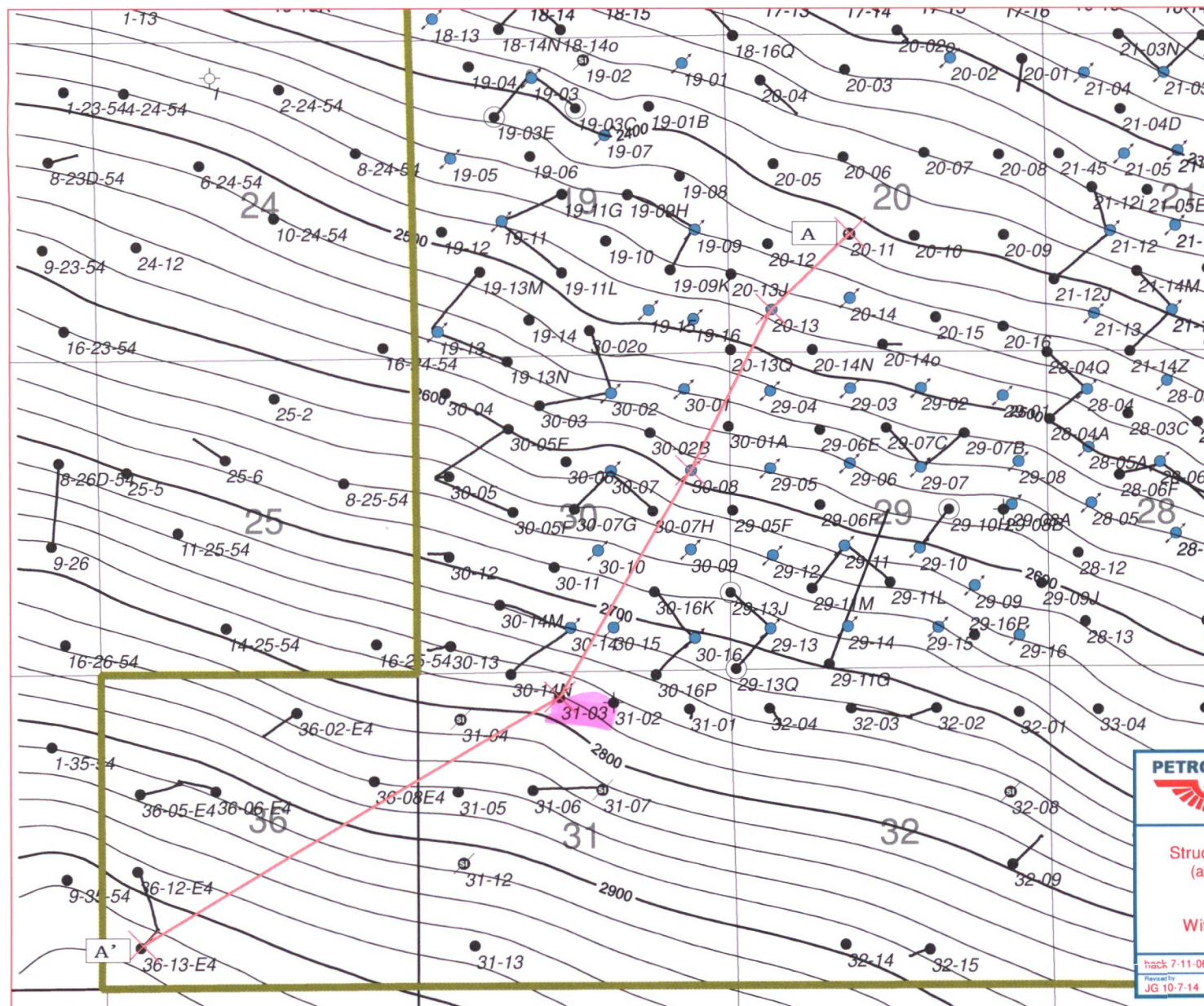


500 0 500 1000 ft

1 inch = 1000 feet



ATTACHMENT NO. 3: Map of the "A" Lime Marker



- Producing Oil Well
- Injection Well
- Injection Well, waiting on water
- PTPI
- D & A
- Waiting on Completion
- TA
- Shut In
- Injector Shut In
- P & A
- Shut In Gas Well

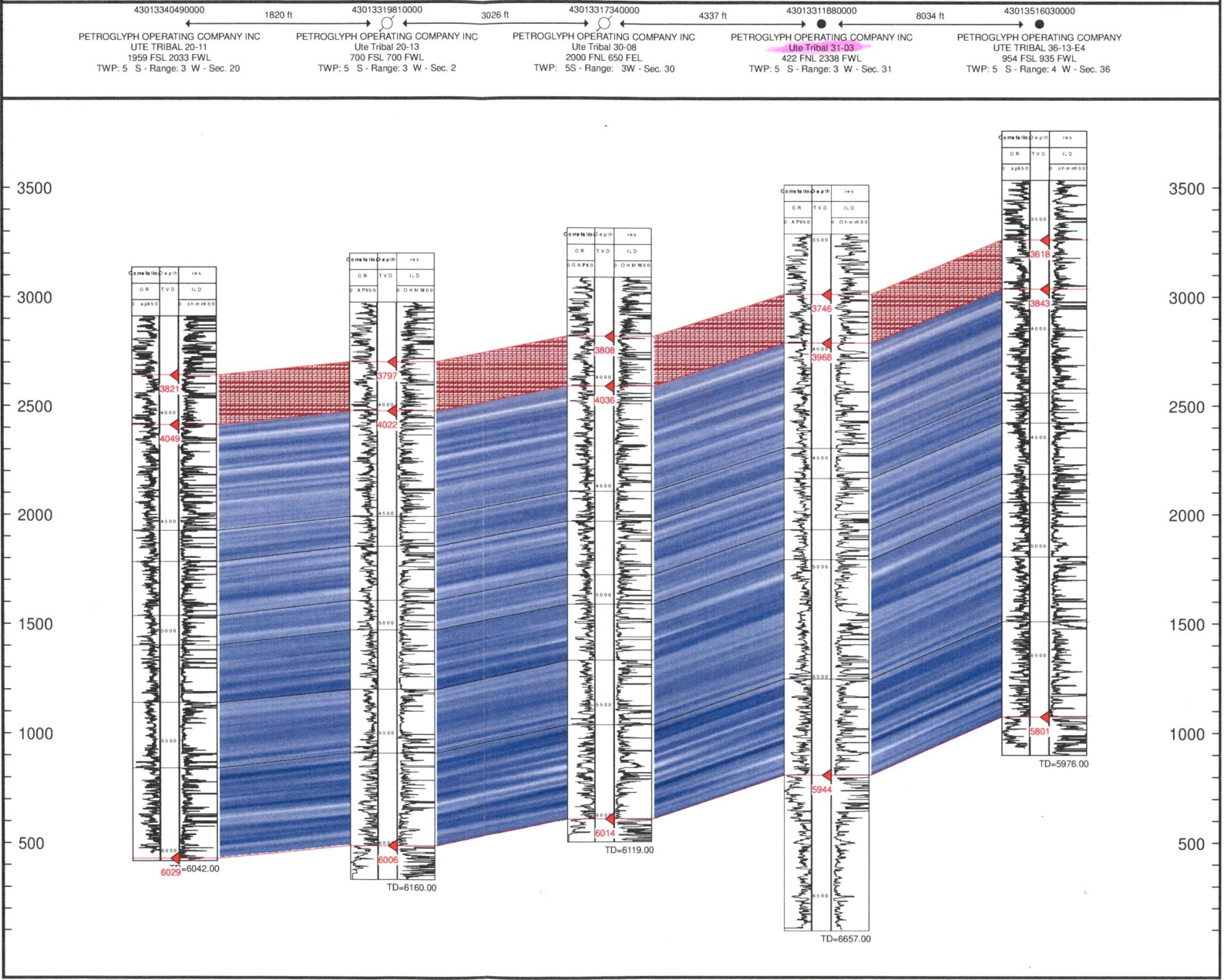
ANTELOPE CREEK
 DUCHESNE COUNTY, UTAH

Structure Map of the "A" Lime Marker
 (approximate top of Injection Zone)
 in the Vicinity of the
 Ute Tribal 31-03
 With Line of Cross Section A to A'

track 7-11-06
 Revised by
 JG 10-7-14

Petroglyph Energy, Inc. 555 S. Cole Rd. Suite 10209
 ISSV/Gas/Utah Regional_CTI 31-03 structure map.gdp

Structural Cross Section A to A' in the Vicinity of Ute Tribal 31-03



*Maximum Allowable Injection Pressure (MAIP)
From Fracture Gradient*

Date: 08/31/2015 *Operator:* Petroglyph
Well: Ute Tribal 31-03
Permit #: _____

Enter the following values:

<i>Specific Gravity of injectate</i> =	1.010	g/cc
<i>Depth to top of injection interval</i> =	3,968	feet
<i>Fracture Gradient (F G)</i> =	0.880	psi/ft

$MAIP =$ 1,755 psig

(rounded down to nearest 5 psig)

where:

$$MSIP = [FG - (0.433 * SG)] * \text{Depth to top of injection interval} = 1756.515$$

